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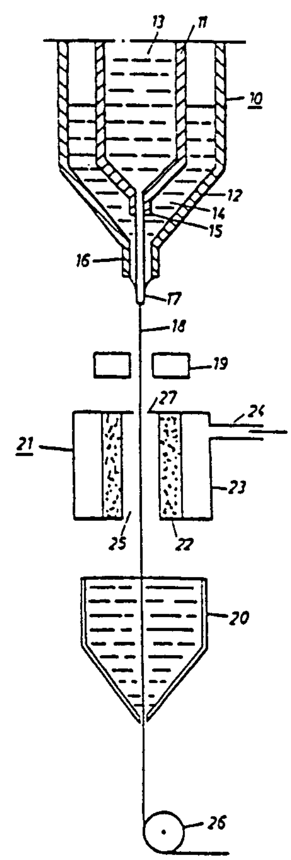
(54) Title: A DEVICE IN EQUIPMENT FOR DRAWING GLASS FIBRES

(57) Abstract

In drawing glass fibres intended for optical transmission, the fibre (18) is allowed to pass through a tubular cooling chamber (21) after drawing, the inner wall (22) of the chamber comprising a porous material with open pores. The chamber (21) is connected to a source of compressed gas, suitably dry nitrogen gas. By cooling the hot fibre is prevented from being contaminated and damaged by air humidity, and the fibre tensional strength is increased by compression stresses being built into the outer layer of the fibre. Furthermore, the fibre is prevented from being so hot that it can cure too early and unevenly the protective coating of a curable plastics, which is applied as soon as possible after drawing, to protect and reinforce the glass fibre.



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A DEVICE IN EQUIPMENT FOR DRAWING GLASS FIBRES

TECHNICAL FIELD

The invention relates to a device in equipment for drawing optical fibres.

BACKGROUND ART

Optical fibres are produced by continuous drawing from a melt in a double crucible or from a so-called preform which is heated to a semi-liquid condition. As soon as possible after drawing, the fibre is provided with a coating to increase its strength so that it can be handled without risk for rupture when winding onto a reel and during later cable manufacture.

The coating is usually carried out by the drawn glass fibre passing as soon as possible through a bath of coating material, usually heat-curable silicon rubber. This coating method functions well for thinner fibre dimensions.

DISCLOSURE OF INVENTION

For heavier fibre dimensions, e g 200-300 µm, it has been found that the coating becomes uneven if entry into the silicon rubber bath takes place too close to the drawing location. On entry into the bath it has been found that the fibre has such a high temperature that the rubber cures immediately. One is therefore compelled to move the bath further away from the drawing location, with increased risk of microcracks in the fibre and contamination of its surface, above all with dust and moisture. This increased distance results in a lowering of the drawing speed for thick fibres, due to the fibre diameter decreasing because of the weight thereof. Forced cooling of the fibre close to the drawing location has been found difficult to arrange, since lateral forces which can cause rupture easily occur on the fibre.

In accordance with the invention it is possible to increase the cooling heavily, so that the distance between the drawing location and coating bath may be kept short, simultaneously as the fibre can run without being disturbed by the cooling medium.

A device in equipment for drawing glass fibres in accordance with the invention includes a cooling means placed after the drawing location, and its characterizing features are apparent from the appended claims.

BRIEF DESCRIPTION OF DRAWING

The invention will now be described in detail in conjunction with the appended drawing where Figure 1 schematically illustrates equipment for drawing and coating optical fibres.

MODE FOR CARRYING OUT THE INVENTION

In Figure 1 the numeral 10 denotes a melting crucible for glass, in this case a so-called double crucible of the kind described in the article "Optical Fibres" in the Ericsson Review No 3, 1980, pages 12 and 13. It is primarily intended for producing optical fibres of the so-called step-index type, but can also be used in the production of graded index fibres. It includes an inner crucible 11 containing a glass melt 13 with a high refractive index intended to form the core in the glass fibre, and an outer crucible 12 with a glass melt 14 having a low refractive index and intended to form the sheath or casing of the fibre. The glass melt 13 from the inner crucible runs slowly out through the nozzle 15 in the inner crucible 11, passing through the outer crucible and out through the outer nozzle 16. When it passes the latter nozzle, the core is surrounded by glass from the outer crucible. When the glass melt has passed the outer nozzle 16 a meniscus 17 is formed, and from this the glass is drawn out into a thin fibre 18 with the aid of a capstan means 26. The drawn fibre will have a core of the glass 13 and a cladding of the glass 14.

The fibre diameter is dependent on the drawing rate of the capstan means and the outflow rate through the nozzles 15 and 16, the rate in turn depending on the temperature and viscosity of the glass melts. The diameter is measured with a thickness meter 19 which controls the drawing rate of the capstan means with the aid of suitable conventional control equipment.

After drawing, the fibre is sensitive to scratches and contamination, and must therefore be provided as quickly as possible with a protective coating. This

takes place in a receptacle 20 containing suitable liquid coating material, e g curable silicon rubber, which is cured in a suitable, unillustrated heating means after it has adhered to the fibre and when the fibre has passed out from the receptacle 20. A cooling chamber 21, through which the drawn fibre passes is arranged between the drawing nozzle 16 and the receptacle.

The cooling chamber 21 comprises a tube 22 of a porous material with very fine open pores. The material may suitably be a porous metal, e g bronze, produced by sintering or some other method. The material can also be of other types, e g microporous ceramics or plastics. A vessel 23 is arranged round the outside of the tube and provided with a supply pipe 24 connected to a source for compressed gas, preferably dry nitrogen gas. The gas passes through the porous tube 22 and into the space 25 around the fibre. The large number of pores in the tube 22 ensures that the gas flow coming into the space 24 is very uniformly distributed round the fibre and the latter will not be subjected to any transverse forces. To prevent the gas flow from going upwards and cooling the fibre too early, before it is ready-drawn to the right dimension, the upper opening of the tube 22 is provided with a shield, e g an iris-type aperture, which is solely provided with a fine hole through which the fibre can pass into the tube 22. Due to the cooling, the distance between the drawing nozzle 16 and the receptacle 20 may be shortened considerably. When cooling is carried out with the aid of a dried gas, suitably nitrogen gas, the risk is further decreased of the fibre absorbing water, which heavily reduces the fibre strength by making its way into the microcracks. By such rapid cooling of the fibre, compression stresses are built into the fibre outer layer so that the tensile strength of the fibre increases in the same way as for hardened glass.

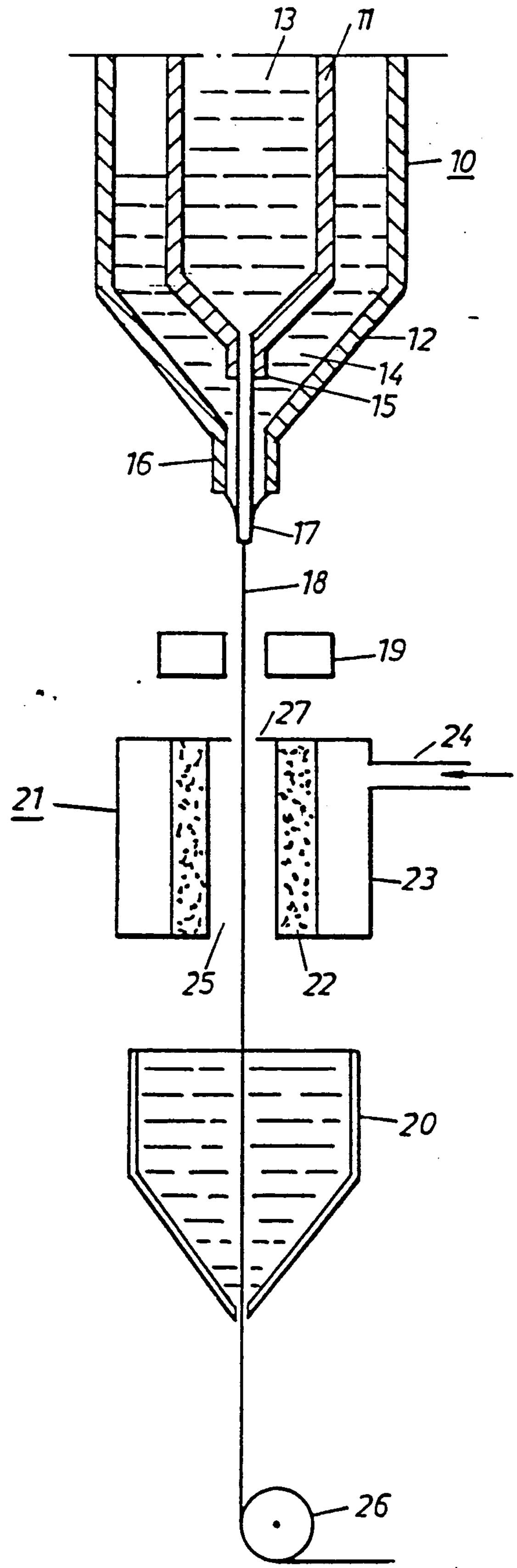
When the fibre passes then through the bath it is cooled such that no curing takes place therein, and the coating will be uniformly distributed around the filament.

CLAIMS

1 A device in equipment for drawing glass fibres for cooling the fibre after drawing, characterized by a cooling chamber (21) surrounding the fibre (18) and including a tubular container, the inner wall (22) of which comprises a porous material with open pores, the chamber being connected to a source (24) of compressed gas which is caused to pass through the inner wall (22) and out towards the passing fibre (18) in an evenly distributed flow.

2 Device as claimed in claim 1, characterized in that the porous material comprises sintered metal.

3 Device as claimed in claim 1, characterized in that the compressed gas is dry nitrogen gas.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TERNATIONAL SEARCH REP⁻RT

International Applica... No PCT/SE82/00432

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [3]

According to International Patent Classification (IPC) or to both National Classification and IPC 3

C 03 B 37/10, C 03 C 25/02

II. FIELDS SEARCHED

Minimum Documentation Searched [4]

Classification System	Classification Symbols
IPC 3	C 03 B 37/00, 37/02, 37/10, C 03 C 25/02, G 02 B 5/14
US Cl	65:3, 12; 350:96, 29-33

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched [5]

SE, NO, DK, FI classes as above

III. DOCUMENTS CONSIDERED TO BE RELEVANT [14]

Category *	Citation of Document, [16] with indication, where appropriate, of the relevant passages [17]	Relevant to Claim No. [18]
A	DE, C, 698 179 (LAMBERT JANSEN) 3 October 1940	1
A	GB, A, 1 559 769 (SIEMENS AKTIENGESELLSCHAFT) 23 January 1980	1

* Special categories of cited documents: [15]

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IV. CERTIFICATION

Date of the Actual Completion of the International Search [2]	Date of Mailing of this International Search Report [2]
1983-03-21	1983-03-31
International Searching Authority [1]	Signature of Authorized Officer [3]
Swedish Patent Office	May Hallne May Hallne